DOCUMENT RESUME

ED 045 524 SO 000 432

AUTHOR	Bogatz, Gerry Ann
TITLE	Manufacturing. Evaluation Report from a Limited School Trial of a Teaching Unit of the High School Geography Project.
INSTITUTION	Educational Testing Service, Princeton, N.J.
SPONS AGENCY	Association of American Geographers, Washington, D.C.; National Science Foundation, Washington, D.C.
PUB DATE	Feb 67
NOTE	58p.
EDRS PRICE	EDRS Price MF-$0.50 HC-$3.00
DESCRIPTORS	Activity Units, Concept Teaching, Curriculum Development, *Curriculum Evaluation, Decision Making Skills, Educational Games, *Environmental Education, *Field Studies, Fundamental Concepts, *Geography, Inductive Methods, Learning Activities, Manufacturing, Secondary Grades, Simulation, Social Studies Units, *Urban Areas
IDENTIFIERS	*High School Geography Project, HSGP

ABSTRACT

The methodology used in the evaluation of this unit is the same as that described in SO 000 433. The same seventy teachers were involved along with 2,400 seventh through twelfth grade students. There were nine activities in this unit: 1) Geographic Patterns of Manufacturing in the United States; 2) Definition of Manufacturing; 3) and 4) Manufacturing the Urban Economy; 5) Location-Decision Game; 6) Plant Location Within a Metropolitan area; 7) Summary Location-Decision Concepts; 8) The Impact of the Metfab Company on an Urban Economy; and 9) Foreign Expansion of the Metfab Company. Each activity in the unit was described with the teacher guide in terms of the major concepts to be taught, the materials needed, an estimated teaching time, a suggested procedure to be followed in class, and answers to questions in the students' materials (a manual of exercises). The specific purposes of this unit were to increase student analytic and decision-making abilities, and student awareness of the spatial dimensions of their environment. Teachers and students found that the unit had promoted the inductive reasoning approach that was desired for all of the units. They also felt that the greatest strength of the unit was the role-playing activity (5). The unit test, evaluation forms, and statistics are appended. See SO 000 433 for a list of the related reports. (SBE)

ED045524

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

MANUFACTURING:
Evaluation Report From a Limited School Trial of a Teaching Unit of the High School Geography Project

Report prepared by Gerry Ann Bogatz,
Test Development

Geography specialist: Herbert H. Friedman,
Test Development

ETS Project Director: George Temp,
Curriculum Studies

February 1967

CURRICULUM STUDIES
EDUCATIONAL TESTING SERVICE
PRINCETON, NEW JERSEY

EDO 45524

CONTENTS

Note 1

Summary of Recommendations for Revising the Unit 3

Description of the Limited School Trials 7

- Purpose of Report 7
- Background Information 7
- Evaluation Instruments 8
- Description of Teachers 8
- Description of the Students 9
- Description of the Unit 10

Test Results and General Impressions of the Unit 13

- Results of the Unit Test 13
- General Impressions of the Unit 13

Suggestions for Revising the Unit 19

- Activity 1 20
- Activity 2 22
- Activities 3 and 4 26
- Activity 5 30
- Activity 6 36
- Activity 7 37
- Activity 8 39
- Activity 9 40

Final Note 45

Appendices 47

NOTE

The High School Geography Project is a course content improvement program in geography sponsored by the Association of American Geographers and supported by the National Science Foundation. The Project's goal is the development of new geography teaching materials at the tenth grade level. Current work is concentrated on development of materials following a course outline on a Settlement Theme.

Further information on the status and plans of the AAG project is available from:

High School Geography Project
P. O. Box 1095
Boulder, Colorado 80302

Steering Committee

Phillip Bacon, Washington
John R. Borchert, Minnesota
Edwin Fenton, Carnegie Inst. Tech.
William L. Garrison, Northwestern
Robert Heller, Minnesota
Preston E. James, Syracuse
Robert B. McNee, Cincinnati
William D. Pattison, Chicago
Clyde P. Patton, Oregon
Donald J. Patton, Carnegie Inst. (Wash.)
Waldo R. Tobler, Michigan
Phillip L. Wagner, Davis, California
Gilbert F. White, Chicago, Chairman

Ex-Officio Members

John P. Augelli, Kansas
Clyde F. Kohn, Iowa
Walter Kollmorgen, Kansas
Alvin A. Munn, Rockville, Maryland
J. Warren Nystrom, Washington, D. C.

Director

Nicholas Helburn

MANUFACTURING UNIT

SUMMARY OF RECOMMENDATIONS FOR REVISING THE UNIT

The following suggestions summarize the major points made in the body of the report.

(1) The reactions of students and teachers suggest that the Manufacturing unit was generally a successful classroom experience. Most teachers agreed that the unit as a whole was of great interest to a majority of their students, that it motivated many to investigate aspects of manufacturing on their own, and that it stimulated individual and group participation.

(2) The test results indicate that the unit has successfully conveyed certain aspects of manufacturing to many students, but that other objectives of the unit have not been fully met. Suggestions for revising certain parts of the unit on the basis of test results are made in the body of the report.

(3) The role-playing activities were judged by teachers to be extremely valuable and successful instruments of learning, and they were judged by most students to be the most interesting activities in the unit. The activity on foreign expansion was welcomed as the first Non-Western Hemisphere activity in the course and many expressed a desire to have the activity expanded.

(4) The reading materials for students should be expanded to include optional readings for the more advanced students and background information for some of the activities. Comments by many students

and teachers indicate a need to simplify the readings, especially for average and below average students.

(5) Students and teachers indicated that the amount of mathematical computations required for successful completion of several activities was excessive. Many of the math problems and concepts, especially in the Transactions Tables, need additional clarification and perhaps simplification. Other time-consuming, if rather simple, math details may need revision to allow additional time for fuller investigation of the unit's basic concepts.

(6) The teacher's guidelines were generally helpful in meeting the needs of most of the teachers. However, the difficulty encountered by many teachers indicates a need for fuller, more detailed, and less complicated explanations of certain activities, primarily those entailing mathematical computations. In addition, many teachers suggested including in the guide a greater amount of geographical background, methods for evaluating student progress, and suggestions for supplementary reading materials.

(7) A majority of teachers thought that the unit test adequately measured the content of the unit. However, some felt that the test's difficult vocabulary and complex sentence structure hindered some students, and care should be taken to reduce the general level of both of these.

Henry Ann Bogatz
ETS

DESCRIPTION OF THE LIMITED SCHOOL TRIALS

A. Purpose of Report

The evaluation report of the Manufacturing unit is designed to serve two purposes. Of primary importance is the need to provide the unit authors and others responsible for the unit's revision with suggestions for modifying the unit. At the same time, statements about the unit's effectiveness are needed to assist in the development and revision of other units. It is hoped that this evaluation may be helpful in formulating materials which are even more effective in accomplishing the educational objectives of the High School Geography Project.

B. Background Information

The Manufacturing unit is one of several units being developed by the High School Geography Project to constitute a geography course for high school students. The course is based on a settlement theme. During the spring of 1966 the unit was taught in Ohio to about 150 students. On the basis of student and teacher reactions and test results designed to evaluate the unit's effectiveness, the unit was revised for the Limited School Trials.

The Limited School Trial of the Manufacturing unit was held during the fall of 1966. It was one of five units taught, following the Introduction, the Inside the City, and the Networks of Cities units, and preceding the Political Processes unit.

C. Evaluation Instruments*

At the beginning of the trial the participating teachers administered the verbal sections of the Cooperative School and College Ability Test (SCAT), Form 3A, to estimate the verbal ability of the students in relation to other high school students. The teachers also administered a pretest in geography. There were four different forms of the pretest, each containing different questions from the posttests of the five units in the Limited School Trials. Each form of the pretest was given to one-fourth of the trial students. Following the teaching of each unit, a unit test was administered to all of the students. A copy of the test for this particular unit is in Appendix D.

At the end of each unit, students and teachers filled out forms evaluating the effectiveness of the entire unit. Teacher evaluations are in Appendix A and student evaluations are in Appendix C. Teachers also completed forms evaluating the different parts of the unit, and their evaluation of the activities are in Appendix B. The suggestions for revising the unit that appear in this report are based on the results of the pretests, unit test, and the evaluation forms completed by teachers and students. Analysis of student reactions was based on a twenty percent sample of student questionnaires.

D. Description of Teachers

There were seventy teachers selected by the HSGP in the Limited School Trials. Twenty-five of the teachers were instructed by the HSGP in the use of materials and objectives of the course, and fifty teachers were given no instruction in the use of materials for this unit. The

---

*The evaluation instruments used (except SCAT) can be found in the Appendices.

seventy teachers were located in fourteen cities throughout the country. Fifty of the teachers taught in the West or Midwest.

According to information obtained by the HSGP, the mean number of semester hours in geography of the seventy teachers was approximately fifteen, and the mean number of semester hours in history, sociology, economics, and other social sciences was approximately forty-nine. Almost sixty percent of the teachers had six or more years of teaching experience, although only thirty-five percent had been teaching geography for six years or more. Twenty of the teachers had majored in geography as either undergraduate or graduate students. Sixty-four of the seventy teachers taught the HSGP course in public schools, three taught in parochial schools, and three in independent schools.

E. Description of the Students

The total number of students in the trial of the Manufacturing unit was about 2,400. Approximately fifty-eight percent of the students were ninth graders, twenty-two percent were tenth graders, eleven percent were twelfth graders, five percent were eleventh graders, and four percent were seventh or eighth graders. About half of the participating students came from schools with a total enrollment between 750 and 1,500.

Performance of the students on the verbal section of the Cooperative School and College Ability Test (SCAT) varied considerably according to grade level. The mean score of the students in the seventh and eighth grades indicates that these students were well above average in verbal ability, their mean score being equivalent to a position between the 82nd and 90th percentiles for eighth grade SCAT norms. The majority

of all students were in the ninth grade, and their mean score was also above average, being equivalent to a position between the 57th and 71st percentiles for ninth grade SCAT norms. The tenth graders were somewhat below average in verbal ability, their mean score falling between the 42nd and 57th percentiles. The eleventh and twelfth grade students were slightly above average in verbal ability. The mean score of eleventh graders was equivalent to a position between the 48th and 67th percentiles, and the mean score of twelfth graders was between the 45th and 68th percentiles.

The results of the verbal section of SCAT can be summarized as follows:

Grade	Number of students	Percentile rank according to appropriate grade norms
7 or 8	95	82-90
9	1,399	57-71
10	516	42-57
11	127	48-67
12	259	45-68

F. Description of the Unit

The Manufacturing unit was prepared under the direction of Dr. Howard A. Stafford. The version of the Manufacturing unit used in the 1966 trial was intended to require approximately fourteen school class periods. Almost all teachers taught the unit in approximately this suggested time, the average number of days spent on the unit being fifteen. The unit was divided into nine activities, each designed to teach certain concepts of geography. Activities are defined to include all the identifiable and distinguishable educational experiences planned

for the unit, including class discussions, individual and group projects, and lectures. Each activity was designed to introduce or reinforce the learning of one or more basic concepts of the unit.

According to the introduction in the teacher's guidelines, the primary purposes of the Manufacturing unit may be summarized as follows:

1. For the students to learn certain concepts and facts about the nature and location of manufacturing activity;
2. For the students to increase their analytic and decision-making abilities, with special reference to a problem in manufacturing geography; and
3. To increase the students' awareness of the spatial dimensions of their environment, especially in regard to manufacturing activity.

The teacher was provided with guidelines which described the objectives and concepts of the unit. Each activity in the unit was described in terms of the major concepts to be taught, the materials needed, an estimated teaching time, a suggested procedure to be followed in class, and answers to questions in the student materials. Each student was provided with a manual of exercises.

TEST RESULTS AND GENERAL IMPRESSIONS OF THE UNIT

A. Results of the Unit Test*

The following test results are based on thirty-seven questions of the unit test administered at the end of the Manufacturing unit. These are compared with the results of the identical questions which were given before the unit began. A copy of the test appears in Appendix A.

The unit test was designed to measure an understanding of the basic concepts taught in the unit. The unit test mean score was 19.5. Reliability was approximately .80. On the average, each of the thirty-seven questions pertaining to this unit was answered correctly on the pretest by thirty-eight and one-half percent of the students, while on the unit test each question was answered correctly by fifty-three and one-half percent of the students. Thus, from the pretest to the unit test there was a mean increase of fifteen percent in the number of students answering the questions correctly. Approximately two-thirds of the teachers felt that the unit test adequately measured the content of the unit as they had taught it. Most of the other teachers mentioned the difficult vocabulary and the complex sentence structure of many questions as the primary problems.

B. General Impressions of the Unit

The following observations about the Manufacturing unit are based on the questionnaire filled out by teachers and students. Student impressions are based on a twenty percent sample (430) of student forms.

---

*Three questions on the unit test, numbers 16, 23, and 27, were judged defective and are not included in the test analysis.

From this sample, two additional groups, those who scored in the upper and lower quintiles on the verbal aptitude test, were isolated for comparison with the total sample.

Teacher impressions are based on the responses of fifty-seven teachers who completed the Teacher Unit Evaluation Form.

1. The Unit as a Whole

In general, teachers and students were favorably impressed with the unit as a whole. Teachers generally agreed that their students had found most of the unit to be an enjoyable learning experience and that the unit had promoted the inductive reasoning approach that is desired for all of the units in the course.

Most teachers felt that the greatest strength of the unit was the interest, motivation, and learning sparked by the role playing activity (#5). Several teachers commented on the fact that attendance in their classes improved noticeably during the six days of this activity, and most teachers agreed that the experience had successfully introduced elements of reality and student responsibility into the course.

The primary problem encountered by teachers was the difficulty and amount of math computations required for successful completion of many of the activities. A related problem was the insufficient explanations provided for both teachers and students for the solution of these math problems. These two difficulties were mentioned by all but a few teachers and by a large number of students.

Approximately seventy percent of the teachers felt that the subject matter of the unit was not too complicated for their students, and only two teachers thought it was too simple. Again the major problem

centered around the difficulty and excessive amount of math in many of the activities. All but seven teachers indicated that the subject matter was well organized.

The time allotted for the teaching of the unit seemed sufficient. Only six teachers suggested allowing more time to teach the unit as a whole, although individual activities may require more or less time than suggested.

Over three-fourths of the students thought that the unit as a whole was either extremely or generally interesting. Students whose verbal ability scores were highest indicated a greater degree of interest in the unit than other students. Students' suggestions for improving the unit generally coincided with their teachers' impressions. A significant number of students suggested simplifying and clarifying the directions, including more illustrations in their manuals, simplifying the vocabulary, reducing the amount of math calculations, and allowing more time for the unit.

2. The Student Reading Materials

Almost sixty percent of the students thought that the readings in their student manual were either generally or extremely interesting. Students whose verbal ability scores were in the lowest quintile indicated somewhat less interest in the readings than other students.

Over three-fourths of the teachers felt that the reading materials were clearly written for the above average students, and there was about a fifty-fifty split as to the appropriateness of the readings for the average students. Over eighty percent of the teachers felt that the readings were not clearly written for below average students. Almost

three--fourths of the teachers agreed that the readings were well-organized from an instructor's point of view.

One of the major criticisms of the unit was the lack of student readings, with seventy percent of the teachers suggesting that students be given additional explanations, background information, and examples in their manuals. Only three teachers suggested reducing the amount of student reading in the unit. Ten teachers also felt that some of the vocabulary in the student readings was too difficult, and they suggested clarification of some of the more technical terms or the inclusion of a glossary of terms for easy reference. Several teachers suggested that the manual include case studies of some actual manufacturing problems and that a summary of the basic concepts be included at the end of each activity or at the end of the unit. Many teachers felt that the unit lacked visual stimuli and suggested that pictures and short accounts of manufacturing processes and personnel be included in the unit. One teacher suggested including the following articles for the students:

a. Chapter 3 of Raymond Vernons' Metropoli 1985, "Growth of the Region Industries"

b. City and Suburbs, ed. Benjamin Chrisity "The Structure of Metropolitan Economy"

3. Teacher's Guidelines

The teacher's guidelines were generally helpful in meeting the professional needs of most of the teachers. Almost ninety percent of the teachers found it extremely or generally helpful in clarifying the objectives of the unit, and about three-fourths of the teachers found it helpful in suggesting a variety of learning activities. About sixty

percent of the teachers found the guidelines helpful in providing needed geographical background. However, many teachers who felt that the guide was inadequate in this respect identified the lack of geographic background as one of the greatest weaknesses of the unit. About two-thirds of the teachers thought that the guide was inadequate in suggesting supplementary reading materials for the students. Since seventy percent of the teachers also felt that there should be more required student readings in the unit, the need for more required and optional readings is indicated. About three-fourths of the teachers felt that the guidelines were also inadequate in providing guidelines for continuous evaluation of student progress. Six teachers suggested that the guide include one or more quizzes to alleviate this problem.

About twenty teachers criticized the guidelines for their lack of sufficient explanations in many activities. This was especially true of mathematical computations for which teachers were given the answer but were not shown the method of arriving at it. Many recommended that all explanations be made more explicit and that they be presented to both teachers and students in a step-by-step approach. A minor suggestion for the guide and one which might be helpful for all the units is the inclusion of the page numbers where materials can be found in the student manual.

SUGGESTIONS FOR REVISING THE UNIT

The Manufacturing unit is divided into nine activities and each activity is designed to develop an understanding of one or more of the unit's concepts. By relating each test question to one or more of the concepts, and thereby relating it to one or more of the activities of the unit, it is possible to analyze the extent to which each activity contributes to this understanding. The evaluation of each activity will include a statement of the concept(s) it hoped to teach, a description of the student exercises performed in the activity, and results of the test questions pertaining to that activity. Test results will be reported in terms of the percent of students who correctly answered each question on the pretest versus the percent of these same students who correctly answered it on the unit test. This is followed by suggestions for revising the unit based on test results.

The discussions of the activities will also include general observations made by the teachers and unit evaluators with respect to the following: (a) whether the student and teacher directions were clear; (b) whether the activity was effective in stimulating the interest of the students; (c) whether the activity was effective in helping the students learn what was intended; (d) whether the activity should be retained in the unit with or without revision, or whether it should be eliminated. These judgments will be followed by specific suggestions for revising the activities, based on the teacher and student impressions and comments.

Activities 1 and 2 are designed to develop an understanding of the following concepts:

A. Manufacturing is an activity which has distinguishing characteristics.

1. Manufacturing places its emphasis upon a tangible product rather than a service.
2. Manufacturing is carried on in a factory with inputs of material and outputs of products.
3. Most manufacturing is part of a production sequence.
4. Manufacturing activities exhibit distinctive spatial patterns.

Activity 1: Geographic Patterns of Manufacturing in the United States (fifty-four teachers reporting)

Activity 1 is designed to give the students an opportunity to examine a few general manufacturing patterns in the United States and to make some preliminary observations. The activity contains an exercise in which students match descriptions of manufacturing activities with maps of the United States that show the distribution of these activities.

The unit test contained four questions designed to measure the students' ability to identify maps of the distributions of these manufacturing activities. The results of these questions and the concept to which they are related are:

(See table on following page)

Question #	Concept	Pretest (% of Students Answering Correctly)	Posttest (% of Students Answering Correctly)	Increase in % of Students Answering Correctly
3	A4	40	71	31
4	A4	42	58	16
5	A4	30	54	24
6	A4	42	57	15
		M 38½%	M 60%	M 21½%

An average of thirty-eight and one-half percent of the students correctly answered each of the four questions on the pretest (the same as for all questions). On the unit test, each question was correctly answered by an average of sixty percent of these same students (as compared with fifty-three and one-half percent for all questions). Thus, from the pretest to the unit test there was a mean increase of twenty-one and one-half percent in the number of students correctly answering the questions related to Activity 1 (as compared with a mean increase of fifteen percent for all questions).

Questions 3-6 were duplicates of the questions asked in the exercise for Activity 1. Over half of the students correctly matched each of the maps with its description. Students have gained from their experience with the exercise.

Approximately ninety percent of the teachers felt that the directions in the teacher's guidelines and in the student materials were clear. About eighty percent of the teachers thought that the activity was either generally or extremely effective in stimulating student interest and in helping students learn what was intended. Half of the teachers suggested retaining the activity without revision and the

others would retain it with some revisions.

About seventy percent of the students found the activity extremely or generally interesting. The following suggestions were made for Activity 1:

1. Be more specific about the statement on page 3 of the guidelines, that "additional information should be supplied by the teacher."
2. Remove the legend from Map E in the student materials since the use of "canneries" tends to give the question away.
3. Many students required more background information about the industries involved in order to base their decisions on fact. Several teachers mentioned that their students wanted to know why different industries had located where they had and a brief history of each might solve both of these problems.
4. The first activity of the unit should provide more visual stimulus than a map exercise. Several teachers suggested including transparencies of the maps, pictures of manufacturing plants, and a tape recording of some of the industries' descriptions.
5. Six teachers mentioned that Map C presented problems for the majority of their students. As a map of all manufacturing, it might be studied separately so as not to be confused with maps of the distributions of specific industries.

Activity 2: Definition of Manufacturing (fifty teachers reporting)

Activity 2 is designed to lead the students to formulate a definition of manufacturing, stressing that manufacturing focusses on a tangible product and is carried on in a factory.

The unit test contained nine questions designed to measure the concepts taught in this activity. The results of the nine questions are:

Question #	Concept	Pretest (% of Students Answering Correctly)	Posttest (% of Students Answering Correctly)	Increase in % of Students Answering Correctly
1	A	71	86	15
2	A_1	62	85	23
13	A_2	36	56	20
7	$A_{2 \& 3}$	24	32	8
8	$A_{2 \& 3}$	24	34	10
9	$A_{2 \& 3}$	28½	34	5½
10	$A_{2 \& 3}$	28	44	16
12	A_3	10	16	6
24	A_3	24	28	4
		M 34%	M 46%	M 12%

An average of thirty-four percent of the students correctly answered each of the nine questions on the pretest (as compared with thirty-eight and one-half percent for all questions). On the unit test, each question was correctly answered by an average of forty-six percent of these same students (as compared with fifty-three and one-third percent for all questions). Thus, from the pretest to the posttest, there was a mean increase of twelve percent in the number of students correctly answering the questions related to Activity 2 of the unit (as compared with fifteen percent for all questions).

In question 1, eighty-five percent of the students were able to identify a photograph of a manufacturing activity. For question 2,

almost as many students were able to select a manufacturing activity from three service activities. Over half of the students knew the definition of form utility asked for in question 13.

Questions 7, 9, and 10 require students to match flow charts of three of the same manufacturing activities studied in the exercise in Activity 1. This was similar to an optional exercise in Activity 2, and only about one-third of the students were able to transfer knowledge learned to this relatively strange situation. Question 8 requires this matching for an industry not discussed in the unit. One would expect such a question to elicit poorer performance; however, this question performed in much the same way as the other three in the set. These activities did not contribute very much to the students' ability to visualize the manufacturing process of specific industries.

Questions 12 and 24 deal directly with the concept that most manufacturing is part of a production sequence. The results indicate that almost all students did not realize that most manufacturing activities deal with semifinished products and are but one step in a line of manufacturing processes. This aspect of the definition of manufacturing could be emphasized in the unit.

Over eighty percent of the teachers felt that the directions in the teacher's guidelines were clear. There were no student materials for Activity 2. About three-fourths of the teachers thought that the activity was effective in stimulating student interest and in helping students learn what was intended. About half of the teachers would retain the activity without revision, and the others suggested retaining the activity with some revisions.

About sixty percent of the students thought that the activity was either generally or extremely interesting. However, about one-fifth of them thought that it was the least interesting activity in the unit.

The following were made as suggestions for revising the unit:

1. Nine teachers commented that paragraph A 1 on page 9 of the teacher's guidelines was unclear. Provide a fuller explanation of what is meant by form utility, economic utility, and secondary and tertiary activity.
2. Suggest an alternate exercise for the first part of the activity for classes in small towns that do not have many manufacturing establishments.
3. Include the formal definitions of manufacturing in the student materials or make them available to the students after they have arrived at their own definition.
4. The results of questions 7-10 and the comments of several teachers indicate that an expansion of part B of the activity is needed. Several more examples of the flow chart for different manufacturing activities should help familiarize students with the stages of manufacturing. Two teachers also suggested including a case study of a manufacturing plant to promote a greater amount of student interest in the activity. Another suggested using overlays to show a simple flow and proceeding to more complicated patterns. Several others felt that students should be given the flow chart in their manual.
5. Three teachers made part A of the activity a more formal exercise. They asked students either to interview an employee of

a local manufacturing establishment or to obtain information about many different types of manufacturing in the local area. Since several teachers felt that the activity should be more structured, these suggestions might be included in the guidelines.

Activities 3 and 4: Manufacturing and the Urban Economy, I and II (fifty-two teachers reporting)

Activities 3 and 4 are interrelated and will be discussed together in this report. They are designed to develop an understanding of the following concepts:

B. Manufacturing is a settlement-forming activity.

1. Manufacturing is usually an urban activity.
2. Value added by manufacturing activity is an important element in urban economies.

Activity 3 is a discussion of the contributions of manufacturing to an urban economy. Activity 4 is a discussion and an optional exercise on how a change in the level of manufacturing activity affects the total economy.

There were five questions on the unit test designed to measure the students' understanding of the concepts taught by these activities. The results of these questions are:

(See table on following page)

Question #	Concept	Pretest (% of Students Answering Correctly)	Posttest (% of Students Answering Correctly)	Increase in % of Students Answering Correctly
14	B_{1} & 2	41	60	19
25	B_{1} & 2	45	70	25
26	B_{1} & 2	29	41	12
29	B_{1} & 2	48	64	16
11	B_{2}	19	33	14
		M 36%	M 53%	M 17%

An average of thirty-six percent of the students correctly answered each of the five questions on the pretest (as compared with thirty-eight and one-half percent for all questions). On the unit test, each question was answered correctly by an average of fifty-three percent of these same students (as compared with fifty-three and one-half percent for all questions). Thus, from the pretest to the unit test there was a mean increase of about seventeen percent in the number of students correctly answering the questions related to these concepts (as compared with fifteen percent for all questions).

Questions 14, 25, 26, and 29 deal with the advantages of manufacturing for a city and the affects on a city when manufacturing leaves. The results of these four questions indicate that the activities have contributed to many students' understanding of the value of manufacturing. In question 26 less than half of the students correctly identified the establishment of new retail businesses as the reason why most cities encourage plants to locate in their area. However, another one-fourth of the students thought that the existence of surplus labor in the city would be an important reason, and this is a reason why some, if not most,

cities encourage plants to locate. The results of these four questions indicate that the unit has contributed to the students' understanding of the value added by manufacturing.

Question 11 requires knowledge that the difference between input and output is the value added by manufacturing. The small percentage correctly answering it may be partially explained by the fact that this is discussed mainly in an optional exercise. However, most classes did perform the exercise. The concept needs to be stressed in this or in some other part of the unit.

About half of all the students thought that Activities 3 and 4 were either generally or extremely interesting. However, over one-fifth of the students felt that they were the least interesting and the most difficult activities in the unit.

Teacher Comments for Activity 3:

All but three teachers felt that the directions in their guidelines were clear. There were no student materials for this activity. About two-thirds of the teachers thought that the activity was effective in stimulating student interest and in helping students learn what was intended. About half of the teachers suggested retaining the activity without revision, and all but one other would retain it with certain revisions.

1. Clarify what is meant by direct employment.
2. Expand the four points under B and include a reading and a written exercise for the students in their manual.
3. Point A in Activity 3 is a repetition of part of the discussion in Activity 2. Point B could be incorporated in Activity 2 and the activity could be eliminated.

Teacher Comments for Activity 4:

About one-third of the teachers suggested allowing more time to teach the activity. Almost half thought that the directions in the guidelines and student materials needed clarification.

Less than half of the teachers felt that Activity 4 was effective in stimulating student interest, and about half felt that it was effective in helping students learn what was intended. Only about one-fourth of the teachers thought that the activity should be retained without revision, sixty percent felt that it should be revised, and ten percent felt that it should be eliminated. Over one-fifth of the teachers thought that Activity 4 was the least effective activity in the unit.

1. Thirty-four teachers said that the most difficult part of the activity for both students and teachers was the calculations for optional exercise 2, especially the second round inputs. A clear and simple explanation of the way to compute these figures seems necessary, including a step-by-step explanation of how to determine first and second round inputs.
2. Provide a transparency of the flow chart on page 18 of the guidelines and one of an incompleted transaction table for the class to work on together.
3. One teacher suggested making the activity more specific by using a case study. He suggested an NBC documentary on the situation when the stock yards virtually closed down.
4. Clarify the meaning of reciprocal flow and multiplier effect. Several teachers felt that the latter had been lost in the "wealth" of mathematics. One teacher suggested introducing

the multiplier effect with a simple banking problem to show how a bank increases its earnings by continually lending money. This principle could then be applied to manufacturing to show the great difference between first and second round inputs.

5. Include a short reading for students on point A, what would happen to a town if a manufacturer left.

Activity 5: Location-Decision Game (fifty-five teachers reporting)

Activity 5 is designed to introduce the following concepts:

C. Manufacturing locates in response to many factors; there are, however, principles which govern the interrelationship among these factors and the resultant locational choice.

1. Locational decisions are usually motivated by a profit factor and involve cost comparisons and weighted opinions.
2. Maximum demand and least cost considerations are usually compromised in making a locational choice.
3. Many complex and indeterminate factors also enter into the decision-making process.
4. Analysis and integration of these complex factors increases the probability of success.

In the location-decision game students are assigned the roles of personnel in a manufacturing concern, the Metfab Company. The roles include a president, a sales manager, a production and purchasing officer, a personnel manager, and a treasurer. The teacher's role is one of a Research Consultant for each group of five students. The game is intended to take six class days, at the end of which each group reports to the class about its decision as to where to locate the Metfab Company and why.

The unit test contained fifteen questions designed to measure the students' understanding of the concepts listed above. The results of these questions are:

Question #	Concept	Pretest (% of Students Answering Correctly)	Posttest (% of Students Answering Correctly)	Increase in % of Students Answering Correctly
30	C	18	24	6
17	C_1	27	40	13
32	$C_{1 \& 2}$	28	40	12
33	$C_{1 \& 2}$	33	40	7
18	$C_{1 \& 4}$	44	59	15
19	$C_{1 \& 4}$	29	40	11
20	$C_{1 \& 4}$	29	49	20
21	$C_{1 \& 4}$	29	49	20
22	$C_{1 \& 4}$	60	85	25
34	$C_{2 \& 4}$	64	80	16
35	$C_{2 \& 4}$	45	53	8
36	$C_{2 \& 4}$	62	80	18
15	C_3	56	74	18
28	C_3	62	82	20
31	C_3	59	70	11
		M 43%	M 58%	M 15%

An average of forty-three percent of the students correctly answered each of the fifteen questions on the pretest (as compared with thirty-eight and one-half percent for all questions). On the unit test, each question was correctly answered by an average of fifty-eight percent of these same students (as compared with fifty-three and one-half percent for all questions). Thus, from the pretest to the posttest,

there was a mean increase of fifteen percent in the number of students correctly answering the questions related to Activity 3 of the unit, the same as for all questions.

The test results indicate that the activity has contributed to students' understanding of many of the basic concepts involved in the location of manufacturing concerns. On question 30 less than one-fourth of the students correctly identified availability of land as a relatively unimportant reason why manufacturers prefer to locate in large urban centers. Almost forty percent selected nearness to other manufacturers as the least important explanation for this preference. The president's role in the activity suggests that a location far from competitors is desirable, and some students may have thought that the terms competitors and manufacturers were synonymous. This distinction should be made in the activity, and perhaps the reasons why large urban centers are good locations need to be emphasized.

Questions 17, 32, and 33 show a lower than average increase from pretest to posttest, and they were answered correctly by fewer than half of the students. They all deal with a location decision when one or more locational factors are uniform through the area. The results indicate a need to emphasize the causes and effects of a uniform factor on a location decision.

Questions 18-22 ask students to select the most important locational factor for certain special situations. The role of labor seems to be well understood as evidenced by the results to question 22. However, the results of the other questions confirm the opinion that the effects of locating near markets, materials, or competitors is not fully

understood by many students and needs additional emphasis in the unit.

Questions 34, 35, 36, 15, 28, and 31 were each answered correctly by over half of the students. Questions 34-36 were based on costs of locating a plant in three different areas. About three-fourths of the students were able to identify locational advantages that were given in a chart, but only about half of the students were able to see a locational advantage that was not computed for them (question 35). The activity might emphasize the basis on which least total costs are computed.

The time suggested for teaching the activity seemed to be adequate for all but nine of the teachers. About three-fourths of the teachers thought that the directions in the guidelines were clear, and about half felt that the directions in the student materials were clear. Over half of the teachers thought that the activity was extremely effective in stimulating student interest and in helping students learn, and about thirty percent felt that it was generally effective in these areas. About one-third of the teachers suggested retaining the activity without revision and the others would make several changes in it. About three-fourths of the teachers said that this activity was the most effective in meeting the objectives of the unit. Comments by teachers indicate that a great many felt that the activity was an excellent group project, that it had motivated students to an unusual degree, and that it had promoted inquisitive and realistic thinking.

In general, students expressed more interest in this activity than in any other in the unit. About eighty percent of all students found it to be either generally or extremely interesting. Students whose

verbal ability scores were in the highest quintile expressed much more interest in the activity than students whose scores were in the lowest quintile. About half of all students thought that the game was the most interesting activity in the unit, and almost as many felt that it had taught them more than any other activity.

The following suggestions were made by teachers to improve the activity:

1. Thirty-four teachers mentioned that their students had great difficulty with the mathematical computations. To alleviate this problem, teachers suggested reducing the number of problems for each role, evening out the amount of math required for each role, simplifying the numbers used in the computations, and giving more explicit, step-by-step instructions for doing the problems.
2. Eight teachers felt that students should be given the answers to the problems, using the time to focus on reasoned and logical decisions based on the given facts. They felt that students became weighted down by the math and lost the purpose of the activity, that the interpretation of the data became obscured by attempts to correctly solve arithmetic problems. Whether or not the math work is retained, many other teachers felt that the activity should place greater emphasis on how the students are to interpret the data. A related problem mentioned by several was the need to define the individual roles more clearly for the students.

3. The mathematics required of the sales manager was mentioned by twelve teachers as being too difficult.
4. Ten teachers suggested reducing the number of cities that are possible sites for the Metfab Company. This should reduce the complexity of the activity to some extent. A few others suggested including United States maps with the possible cities located on them.
5. Provide the students with a greater amount of information to enable them to make the wisest choices, or suggest that teachers make assignments in advance for students to accumulate these data on their own. Suggested for inclusion were readings about the history of each city, maps of each, climate data, pictures of factories in each city, transparencies of the maps in the student materials, a short case study of an actual locational decision of a company, and a film of a business executive conference.
6. Provide the students with a summary of the advantages and disadvantages of locating in each city at the end of the activity. This could serve as a reinforcement of the concepts learned.
7. Clarify or correct the following parts of the activity:
   a. The total labor costs for Milwaukee should be 1,339,000 (page 65 of the guidelines), and its total costs should be 3,505,300 (page 71).
   b. The number of tons to be shipped to New York is given as 1,800 on page 41 of the guidelines and as 1,900 on page 45.

c. Assembly costs in the total costs table are referred to as production costs on page 38 of the guidelines.

d. Explain what is meant by "to the nearest of these cities." For example, teachers questioned whether Buffalo was nearer to Cleveland or New York.

e. More fully explain the following: productivity index, inertia, market competition ratio, potential markets table, and what to do with the average freight rate tables.

f. Since transportation costs of copper are uniform regardless of location, this map and any mention of copper costs could be eliminated.

Activities 6 and 7 are designed to complete the locational decision discussion and to summarize the concepts learned in Activity 5. Students evaluated these two activities together. Almost sixty percent of all students thought that these activities were either generally or extremely interesting. However, about one-fourth of the students thought that Activity 7 was the most difficult activity in the unit.

Activity 6: Plant Location Within a Metropolitan Area (forty-eight teachers reporting)

Activity 6 serves as a short conclusion to the location-decision game with mention of the additional factors that would have to be considered in order to decide on the location of the plant within a metropolitan area.

There were no questions on the unit test specifically related to this activity.

About ninety percent of the teachers felt that the directions in their guidelines were clear. There were no student materials for this activity. About eighty percent of the teachers thought that the activity was either generally or extremely effective in stimulating student interest and in helping students learn what was intended. About two-thirds of the teachers would retain the activity without revision, and the others would make certain changes in it.

The following suggestions for revising the activity were made:

1. Combine this discussion with Activity 5. One teacher reassembled his class into the groups from the game and asked each to decide on ten factors. He found that this worked well.
2. The Portsville map might be used here to help students visualize the various factors. Others suggested that the discussion could be made more specific by including slides and/or maps of each city in the discussion of the factors.
3. Several teachers felt that the activity should be expanded, if only as an optional exercise, if time permitted, and that the role playing game be continued to include the local locational decision.

Activity 7: Summary of Locational Concepts (fifty-two teachers reporting)

Activity 7 is designed to summarize the concepts of Activity 5, the major factors that influence the selection of a location for a manufacturing activity. It includes an exercise that presents the least-cost approach to the location problem.

There were no questions on the unit test specifically designed to measure the success of Activity 7.

Over half of the teachers suggested that more time be allowed for teaching this activity. Almost three-fourths of the teachers thought that the directions in the guidelines were clear, and more than half felt that the student directions were clear. Almost two-thirds of the teachers thought the activity was effective in stimulating student interest and in helping students learn what was intended. Over one-third would retain the activity without revision, over half would make changes, and three teachers suggested eliminating it from the unit.

Teachers made the following suggestions for revising the activity:

1. Provide teachers and students with fuller and clearer explanations for completing the problems. Twenty-five teachers noted that the math was difficult for their students, and many suggested including completed examples of problems with explanations of how the answers were derived. The purpose of these problems might be better illustrated by using actual cities in hypothetical situations or by including visual representations showing distances and multipliers.
2. Page 82 of the guidelines has two errors. In Case B, labor costs if at X should be $150, in order to arrive at the total cost figure of $1,250 as given. In Case C, if at P, transportation costs should be $2,075 since raw materials must be transported to P.
3. Section III presented problems to many classes. It might be mentioned that there are no unloading and reloading costs at

Point P, and why this is the case. Also explain why P (Section III) can't be 100 miles from R, but still less than 300 miles from M, as is assumed on page 8, Point 4 of the guidelines.

Activity 8: The Impact of the Metfab Company on an Urban Economy (forty-one teachers reporting)

Activity 8 is designed as a summary of the first seven activities. It includes a discussion of the affects of the Metfab factory on a metropolitan area and an optional exercise using a Transactions Table similar to the one used in Activity 4.

There were no questions on the unit test designed to measure the effectiveness of this activity.

About three-fourths of the teachers felt that the directions in the guidelines were clear, and about sixty percent thought that the student directions were clear. Only somewhat more than one-third of the teachers felt that Activity 8 was effective in stimulating interest or in helping students learn. Less than half would retain it without revision, about the same number would make some changes, and six teachers suggested eliminating it. Over one-fifth of the teachers felt that this activity was the least effective in meeting the objectives of the unit.

About half of the students thought that the activity was either extremely or generally interesting. However, about one-sixth of the students found Activity 8 to be the least interesting and the most difficult activity in the unit.

Teachers made the following suggestions for revising the activity:

1. Give a clearer and fuller explanation of the Transactions Tables, especially the second round inputs. Teachers generally repeated their suggestions for revising the exercise in Activity 4, with about twenty teachers asking for additional help and step-by-step instruction for the exercise.
2. Several teachers whose classes successfully completed the exercise in Activity 4 felt that Activity 8 was repetitious. They suggested making it a general review of the preceding activities.
3. Label the columns in the tables so that the meaning of the values indicated is clearer.

Activity 9: Foreign Expansion of the Metfab Company (forty-eight teach-reporting)

Activity 9 expands the location-decision game by considering a foreign location for the Metfab Company. It includes an exercise in which each student works with one of five sets of data, communicates his knowledge to the others in his group, and helps to decide on the most suitable countries for foreign expansion.

The unit test contained four questions designed to measure an understanding of some of the principles of foreign investment. The results of these four questions are:

(See table on following page)

Question #	Pretest (% of Students Answering Correctly)	Posttest (% of Students Answering Correctly)	Increase in % of Students Answering Correctly
37	29	39	10
38	32	55	23
39	32	36	4
40	34	63	29
	M 32%	M 48%	M 16%

Activity 9 is the only one that deals with foreign expansion, and the results may have been influenced by the fact that several classes did not complete the activity. However, the results indicate that the activity has contributed to student understanding.

Question 40 deals with the importance of United States investment in a foreign country, one of the factors considered in the activity. The activity has contributed to student understanding of this idea. Likewise, question 38 deals with a factor considered in the unit, the importance of political relationships, and the relatively large increase in the percent answering it correctly indicates the activity's contribution.

However, question 37 also deals with an aspect of foreign location dealt with in the unit, but it was answered correctly on the unit test by only thirty-nine percent of the students. About thirty percent of the students thought that United States investment would be greatest in countries that supply the United States with basic mineral products. The products of the Metfab Company are steel and copper and the large amount of time spent in considering these factors may have confused some students. Investment in countries with large amounts of manufacturing

should be stressed in the unit. Question 39 requires students to know that the United States invests small amounts in Africa because of poor returns on investments. This fact is not specifically taught in the unit, but the curriculum developers might like to stress the reasons for the lack of investment in certain areas.

Over one-third of the teachers suggested that more time be allowed for teaching this activity. About ninety percent of the teachers thought that the directions in their guidelines were clear, and about three-fourths of them thought that the student directions were clear. About one-third of the teachers felt that the activity was extremely effective in stimulating student interest, and about half felt that it was generally effective in this respect. About three-fourths of the teachers thought it effective in helping students learn what was intended. About half of the teachers would retain the activity without revision, and all but one other would retain it after making certain changes.

About seventy percent of the students thought that the activity was either generally or extremely interesting. Students whose verbal ability scores were in the highest quintile for the group expressed greater interest in the activity than the other students. About fifteen percent of all students felt that this was the most interesting activity in the unit.

In general, student and teacher reactions to Activity 9 were very positive. Since the activity is a continuation of the location-decision game (Activity 5), the reactions confirm the opinion that role playing in this unit was extremely effective in motivating a majority of the students.

The following suggestions were made by teachers for revising the activity:

1. Eleven teachers noted that the section on Trends in United States Foreign Investment was difficult for their students. Many had trouble computing percentage growth and inclusion of these figures should make the task easier for the students.
2. Many teachers noted that a great many students had an insufficient background to successfully complete some of the maps. Suggestions for simplifying the task included:
   a. Provide a map with the countries labelled so that students can work directly on their map without having to refer to an atlas.
   b. Provide a larger map so that small countries, especially in Europe, can be easily identified.
   c. List the countries in the Common Market for the students.
   d. Many students had trouble distinguishing between "friendly" and "unfriendly" countries. Either give the students more background material or list the friendly and unfriendly countries for them.
   e. It is very time consuming to rank countries according to the total number employed in manufacturing and this should be done for the students.
   f. It is difficult to decide what is considered "much, moderate, or little" United States investment and "high, middle, and low" employment. Divisions for these distinctions might be suggested for the students.

g. The "other areas" on page 71 of the student materials is a vague reference and needs clarification.

3. Most teachers felt that this activity was extremely worthwhile. Many suggested expanding the activity to give students a chance to further investigate foreign investment. One possibility is to have students select a city within one of the countries, perhaps with the aid of short readings. Many noted a great lack of student knowledge of foreign countries and wished to continue the study.

Final Note

The work reported here is only one portion of the effort to test in the classroom the units being developed by the High School Geography Project. It seems important, considering the difficulty of the task of evaluation, to comment briefly about the uses of the data and suggestions that are appropriate.

First, it should be possible to revise, expand, and rewrite certain portions of the student materials.

Secondly, it should be possible to improve the test instrument so that eventual use of the items by classroom teachers may be more helpful.

And finally, it should be possible now to design and execute a much larger study of the usefulness, appropriate student populations for the unit work, and results to be expected from use of the materials.

The classroom trial of this unit has partially set the stage for the fruitful investigation, with a representative sample of schools, of the HSGP Settlement Theme course. Therefore, we end our report with a note calling for that research and investigation as the materials become available.

APPENDICES

APPENDIX A*

TEACHER EVALUATIONS OF THE MANUFACTURING UNIT

A. Reading Materials	Yes	No	Omit
1. Do you believe the reading materials are clearly written and understandable for the average student?	51%	48%	1%
2. Do you believe the reading materials are clearly written and understandable for the above average student?	78%	18%	4%
3. Do you believe the reading materials are clearly written and understandable for the below average student?	16%	82%	2%
4. Do you believe the reading materials are well-organized from an instructor's point of view?	72%	23%	5%
5. Should there be more student reading in the unit?	70%	26%	4%
6. Should there be less student reading in the unit?	5%	91%	4%

B. The Subject Matter in the Unit

7. Is the subject matter of the unit too complicated for students?	30%	70%	0%
8. Is the subject matter of the unit too simple for students?	4%	94%	2%

9. How would you rate the manner in which the subject matter is organized?

24% Excellent 61% Generally godd 9% Somewhat Poor 4% Definitely poor
2% Omit

C. Teacher's Guidelines

How helpful were the teacher's guidelines in

10. Clarifying the objectives of the unit?

28% Very helpful 58% Generally helpful 14% Somewhat inadequate
0% Definitely inadequate

11. Suggesting a variety of learning activities?

12% Very helpful 65% Generally helpful 19% Somewhat inadequate
2% Definitely inadequate 2% Omit

*Appendix A is based on the responses of 57 teachers

18. Teachers were to indicate their judgment about the degree of interest each activity had for the majority of students. In the column at the far right each activity was rated as follows: A essential to the unit; B could be made optional; C should be dropped or significantly revised. Only fifty of the seventy teachers completed this part of the evaluation form. The percentage of the fifty teachers who responded in the indicated way is recorded.

Activity	Omit	Extremely Interesting	Generally Interesting	Generally Uninteresting	Dull	Rating	Omit
1	2	22	64	10	2	A-54 B-10 C- 4	32
2	6	4	74	14	2	A-44 B-12 C- 6	38
3 & 4	10	10	44	22	14	A-28 B-14 C-26	32
5	8	64	22	4	2	A-56 B- 2 C- 8	34
6 & 7	10	14	54	16	6	A-34 B-12 C-20	34
8	14	10	22	42	12	A-24 B- 2 C-34	40
9	14	40	42	4	0	A-44 B- 8 C- 8	40

APPENDIX B*

TEACHER EVALUATIONS OF THE MANUFACTURING UNIT ACTIVITIES (CHART I)

Activity #	# of Teachers Reporting	Mean # of Class Minutes Spent on Activity	% Suggesting More Time for Activity	% Thinking Teacher's Guide Directions Clear		% Thinking Student Directions Clear	
				YES	NO	YES	NO
1	54	65	13	90	10	90	8
2	50	45	8	84	16	**	
3	52	65	12	94	6	**	
4	52	60	31	58	42	33	42
5	55	260	16	75	25	50	50
6	49	40	21	91	9	**	
7	52	60	58	73	27	58	33
8	41	30	27	75	25	59	32
9	48	110	36	90	10	75	17

* Appendix B is based on teacher responses to questions in the Teacher Activity Evaluation Form. The percentage of teachers who responded to each question in one of the specified ways is indicated.

**There were no student materials for this activity.

TEACHER EVALUATIONS OF THE MANUFACTURING UNIT ACTIVITIES (CHART II)
(% of teachers responding)

Activity	Effectiveness in Stimulating Student Interest				Effectiveness in Helping Students Learn What Was Intended				Opinion on Whether Activity Should be Retained in Unit			Number of Teachers Reporting
	Very Effective	Generally Effective	Generally Ineffective	Definitely Ineffective	Very Effective	Generally Effective	Generally Ineffective	Definitely Ineffective	Yes, Without Revision	Yes, With Revision	No	
1	24	58	15	2	33	46	17	2	50	45	0	54
2	16	58	24	2	26	58	14	2	52	48	0	50
3	17	61	20	2	17	61	20	2	53	43	2	51
4	11	33	43	13	15	40	25	21	27	60	10	52
5	54	29	13	4	55	30	7	7	32	67	0	55
6	14	65	20	2	16	66	16	2	66	33	0	48
7	10	55	23	12	18	47	29	6	37	55	6	52
8	6	30	45	20	10	33	35	20	40	45	15	41
9	33	48	14	2	27	48	21	4	48	48	2	48

APPENDIX C

STUDENT EVALUATIONS OF THE MANUFACTURING UNIT ACTIVITIES (CHART I)*
(% of students having opinion)

Omit or Did Not Remember				Activity	Extremely Interesting				Generally Interesting				Generally Uninteresting				Dull			
High	Middle	Low	Total		High	Middle	Low	Total	High	Middle	Low	Total	High	Middle	Low	Total	High	Middle	Low	Total
0	2	4	2	Unit as a whole	14	16	15	15	72	62	55	63	12	16	16	15	3	4	10	5
0	1	4	1	Reading materials	6	6	13	7	59	52	41	51	29	32	27	30	6	10	15	10
1	1	5	2	1	14	12	18	14	58	60	45	57	21	22	27	23	4	6	5	5
9	12	10	11	2	5	8	13	8	56	50	44	50	23	24	21	23	7	6	12	7
10	9	5	8	3 and 4	9	8	8	8	32	42	38	39	39	32	35	34	10	9	14	10
2	1	13	4	5	53	42	21	40	34	44	38	41	7	4	20	10	4	6	8	6
5	15	10	12	6 and 7	21	20	21	20	45	36	44	39	23	18	15	18	6	10	10	9
25	16	6	16	8	15	8	17	11	30	42	41	39	24	34	25	24	6	10	11	9
7	1	10	8	9	33	25	18	25	48	46	40	45	8	16	21	15	4	6	11	7

*Student evaluations are based on response of a 20% sample of papers (430 students). Students were to indicate their degree of interest in each activity listed. The middle column lists the percentages of the 250 students who scored in the middle 60% on SCAT. The high and low column list the responses of the sample students who scored in the high and low quintiles on SCAT, 100 and 80 students respectively.

APPENDIX C

STUDENT EVALUATIONS OF THE MANUFACTURING UNIT ACTIVITIES (CHART II)*

Activity	% of Students Who Found It MOST INTERESTING				% of Students Who Found It LEAST INTERESTING				% of Students Who Found It Taught Them The Most				% of Students Who Found It MOST DIFFICULT			
	High	Middle	Low	Total	High	Middle	Low	Total	High	Middle	Low	Total	High	Middle	Low	Total
1	5	12	17	12	15	15	14	15	7	8	12	9	5	8	7	7
2	2	2	9	3	12	17	12	16	5	7	9	7	10	8	7	8
3 and 4	4	4	9	5	27	20	24	22	6	6	9	7	25	20	20	21
5	58	52	29	49	5	7	7	7	51	44	28	42	14	13	12	13
6 and 7	10	10	14	11	18	17	17	17	16	16	19	17	24	25	19	24
8	4	2	10	4	13	17	15	16	5	5	14	7	18	17	14	17
9	15	17	10	15	3	7	9	7	5	12	9	10	2	7	10	7
Omit	2	1	1	1	2	1	2	1	5	3	0	3	2	2	11	4

*Student evaluations are based on responses of a 20% sample of papers (430 students). The middle column lists the percentages of the 250 students who scored in the middle 60% on SCAT. The High and Low Column list the responses of the sample students who scored in the high and low quintiles on SCAT, 100 and 80 students respectively.

FORM OHS2

APPENDIX D

MANUFACTURING UNIT TEST

Time—35 minutes

YOU ARE TO INDICATE ALL YOUR ANSWERS ON THE SEPARATE ANSWER SHEET. No credit will be given for anything written in the test book. After you have decided which of the suggested answers you want to give for a question, blacken the corresponding space on the answer sheet.

Example:	Sample Answer
Chicago is a	
(A) state	A ▭
(B) city	B ▬
(C) country	C ▭
(D) continent	D ▭

Give only one answer to each question; no credit will be given for multiple answers. If you wish to change an answer, erase your first line completely and mark your new choice.

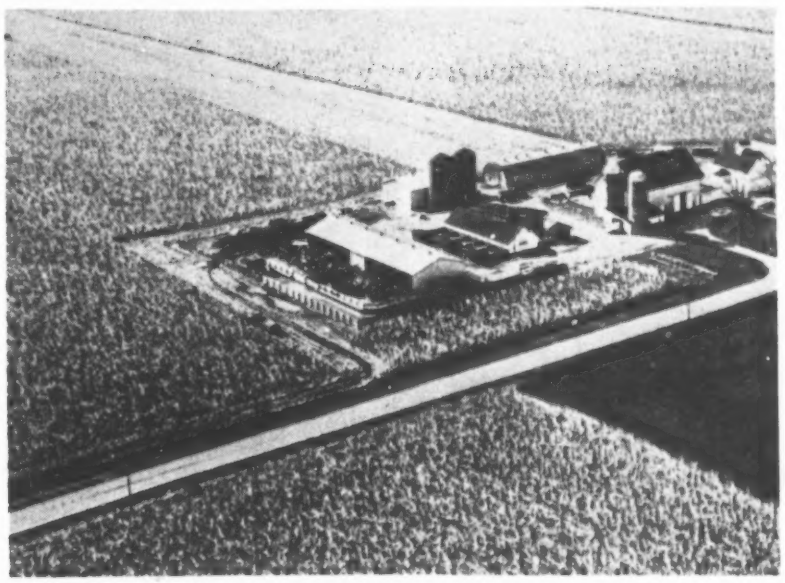
DO NOT OPEN THIS BOOK UNTIL YOU ARE TOLD TO DO SO.

Copyright © 1966
by the
Association of American Geographers
Washington 6, D. C.

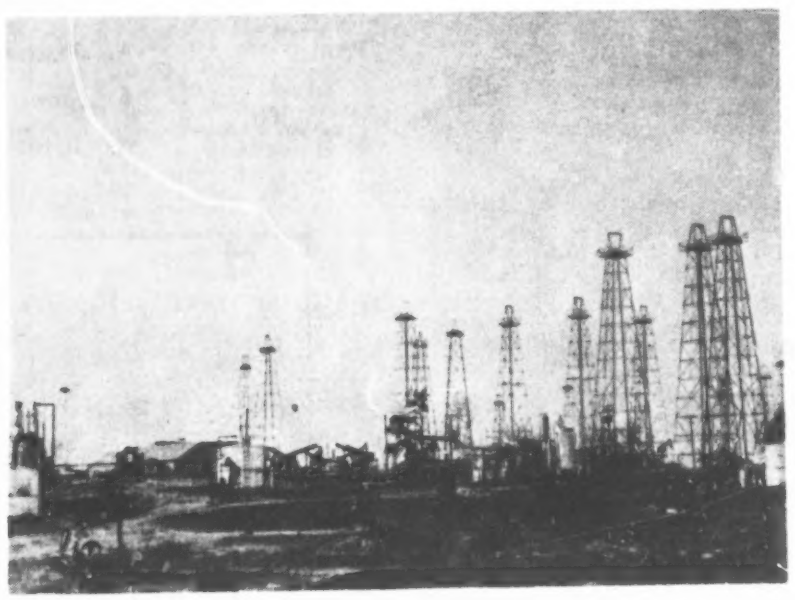
606357
Y96P4.4

Time—35 minutes

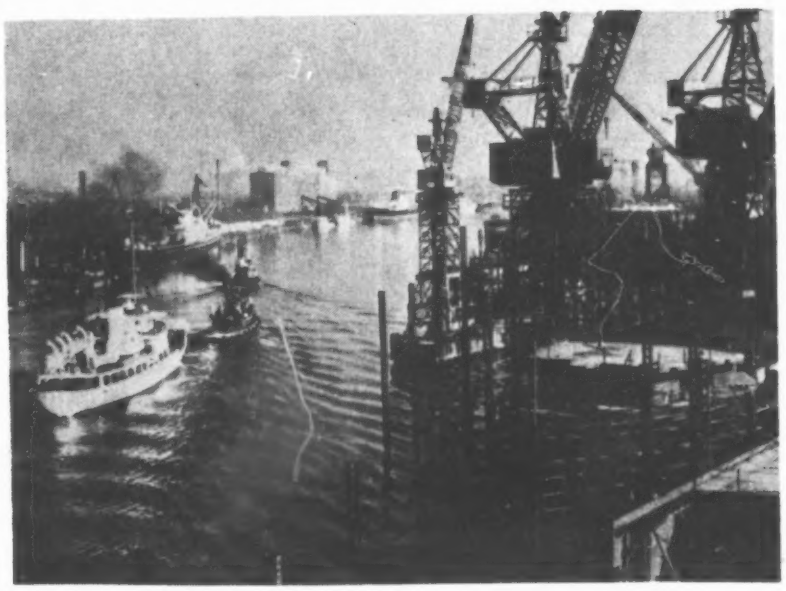
Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one which is best in each case and then blacken the corresponding space on the answer sheet.



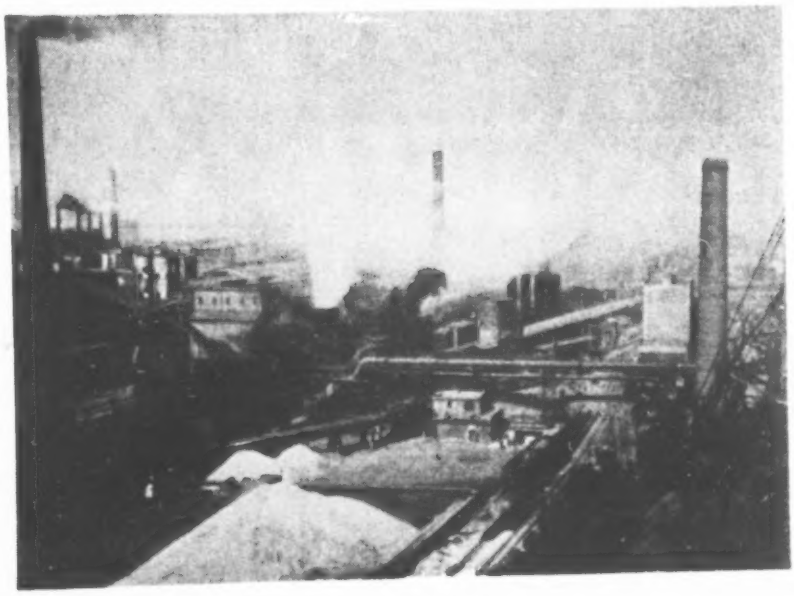
I



II



III



IV

1. Which photograph most clearly represents a manufacturing activity?

   (A) I (B) II (C) III (D) IV

---

2. Which of the following represents a manufacturing activity?

   (A) A gasoline station
   (B) A supermarket
   (C) An ice-making plant
   (D) An appliance repair shop

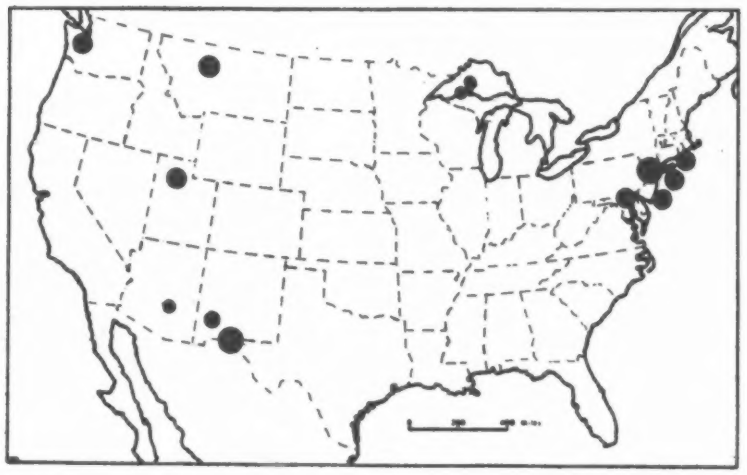
GO ON TO THE NEXT PAGE.

Questions 3-6

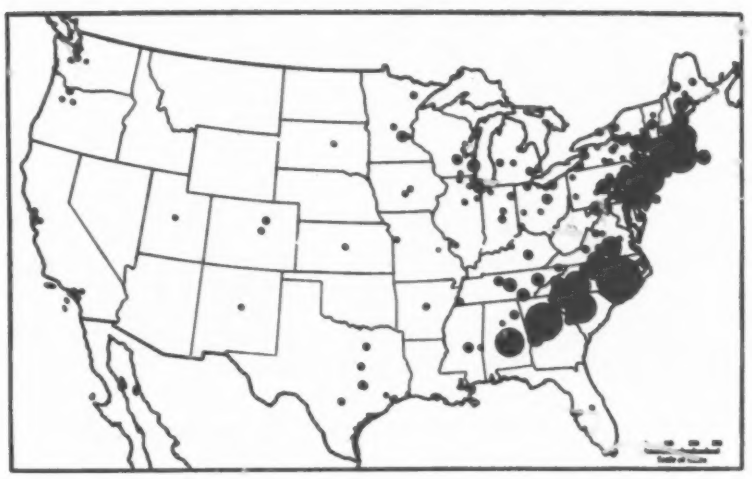
The United States maps (lettered A-D) shown below and on the opposite page depict the locational patterns of four manufacturing activities. Select the appropriate map for each of the manufacturing activities listed below.

3. Copper refining
4. Textiles
5. Steel
6. Fruit and vegetable canning

(A)

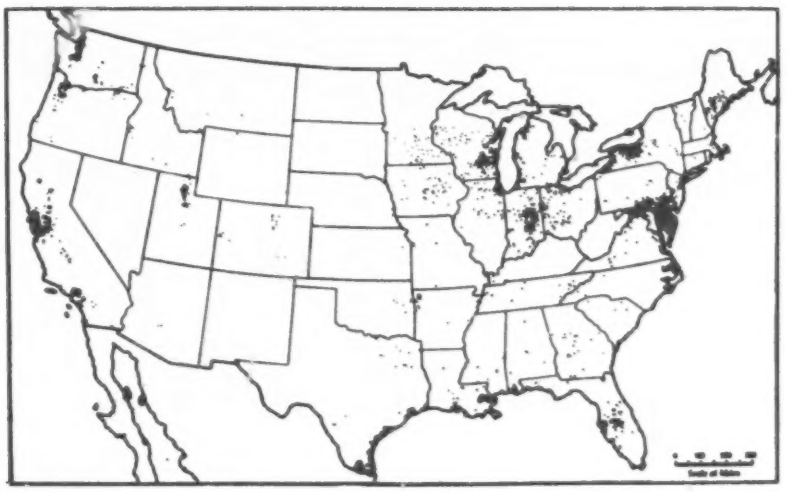


(B)

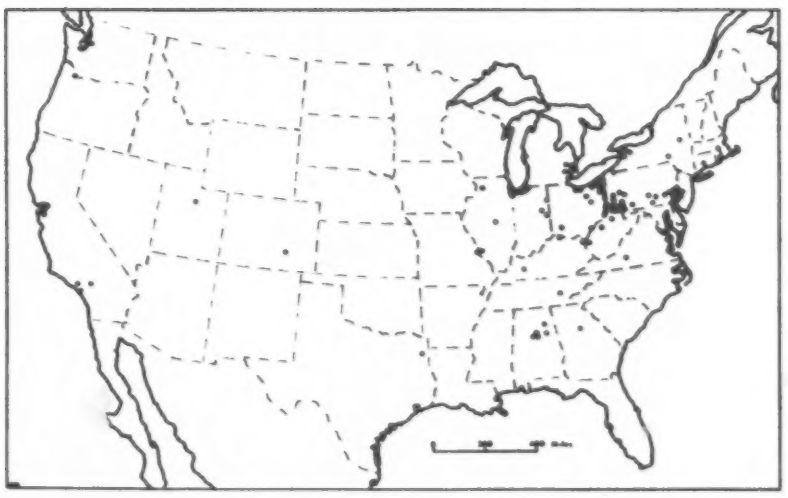


GO ON TO THE NEXT PAGE.

(C)

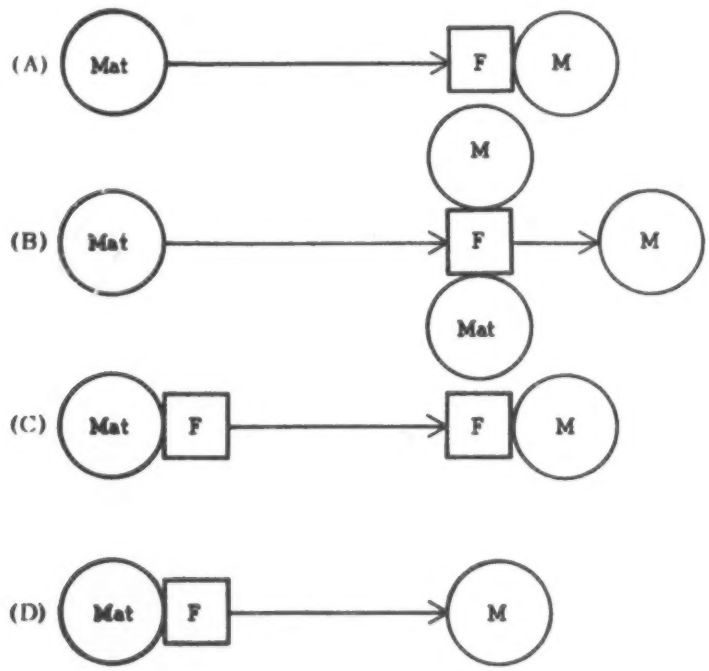


(D)



GO ON TO THE NEXT PAGE.

Questions 7-10 refer to the following diagrams (lettered A-D). In the diagrams, "Mat" indicates the location of materials (inputs), "M" the location of markets (outputs), and "F" the location of factories. Select the diagram that illustrates the correct relationship among materials, markets, and factory locations for each of the manufacturing activities in the questions that follow.



7. Copper refining
8. Soft-drink bottling
9. Steel
10. Fruit and vegetable canning

11. In a manufacturing activity, the difference between the value of the inputs and the value of the outputs can best be described as the

(A) total operational costs
(B) value added by manufacturing
(C) value of products shipped
(D) value of purchased materials

12. In most manufacturing activities, finished products are sold directly to

(A) retail establishments
(B) other manufacturers
(C) final consumers
(D) wholesale establishments

13. In the manufacturing process, form utility refers to the

(A) functional packaging of a product
(B) consumption of products at a prescribed time
(C) assembly of materials into new products
(D) transportation of products to places of consumption

14. All of the following are important contributions of manufacturing to the local economy of an area EXCEPT:

(A) It provides direct employment.
(B) It makes local purchases.
(C) It pays property taxes.
(D) It uses water resources.

15. Which of the following factors is LEAST important in determining the location of a factory?

(A) Markets
(B) Climate
(C) Labor
(D) Materials

16. Which of the following cost factors shows the greatest variation from place to place for most manufacturing?

(A) Taxes
(B) Marketing
(C) Construction
(D) Advertising

17. Which of the following types of purchased material inputs would have the LEAST effect on the location of a manufacturing plant?

(A) Materials that have a uniform delivery price
(B) Materials for which the delivery price varies with the distance from the supplier
(C) Material inputs that account for a small share of the final value of the product
(D) Material inputs that account for a large share of the final value of the product

Questions 18-23 are related to the locational factors (A-D) below. Select the locational factor that you consider to be most important in deciding where to build a factory for each of the special situations presented in the questions that follow. Assume all locational factors not listed to be equal or unimportant. Each factor may be used once, more than once, or not at all.

(A) Market
(B) Materials
(C) Labor
(D) Competitors

18. Product sales depend on rapid delivery and service to customers.

19. The product manufactured is subject to rapid design changes.

20. The cost of shipping finished products to customers is twice the cost of shipping materials to the factory.

21. The cost of shipping finished products from the factory is one-half the cost of shipping materials to the factory.

22. A variety of professional and technical skills is needed in the manufacturing process.

23. The market is widespread and materials are concentrated within the market area.

GO ON TO THE NEXT PAGE.

24. Which of the following conditions is true of most manufacturing activity?

(A) Inputs are in the form of raw materials.
(B) Inputs are in the form of semifinished products.
(C) Inputs are of greater value than outputs.
(D) Inputs are lighter than outputs.

25. If there is a local professional football team in a given area, the manufacturing activity in that area is important to the team primarily because

(A) it stimulates the area's economy
(B) player recruitment is made easier
(C) factory workers enjoy football
(D) it encourages athletic competition

26. Which of the following explains why most cities encourage manufacturing plants to locate in their area?

(A) Increased competition results in more efficient operation.
(B) Labor unions control many city governments.
(C) Surplus labor exists in the city.
(D) New retail businesses will be established.

27. When deciding where to locate a manufacturing plant, it is desirable for one to assess for each location the

(A) total production costs
(B) market potential
(C) total profits
(D) impact of governmental regulations

28. Which of the following is LEAST important to a manufacturer in assessing labor as a locational factor?

(A) Wage rates
(B) Labor productivity
(C) Labor supply
(D) Union dues

29. Which of the following usually occurs when a large manufacturer leaves a community?

(A) Retail sales decrease.
(B) Neighborhood land values increase.
(C) Unemployment decreases.
(D) School attendance increases.

30. Which of the following is LEAST important in explaining why many manufacturers prefer to locate factories in large urban centers?

(A) Availability of urban services
(B) Abundant labor supply
(C) Nearness to other manufacturers
(D) Availability of land for construction

31. Transportation costs are an important consideration in the location of a factory because

(A) parking lots must be provided for employees
(B) materials must be moved to the factory and finished products moved to the market
(C) large per mile cost differences exist among truck, railroad, and airline carriers
(D) finished products cost more to transport than materials

32. A manufacturer who locates a factory solely on the basis of obtaining maximum sales assumes that

(A) transportation and production costs are approximately equal everywhere
(B) demand for the product is approximately equal everywhere
(C) demand for the product is independent of the factory's location
(D) sales of the product are independent of pricing schedules

33. A manufacturer who locates a factory on the basis of production and transportation costs assumes that

(A) costs are approximately equal everywhere
(B) demand for the product is variable
(C) demand for the product remains constant as factory location changes
(D) factory location is a minor factor in determining profits

GO ON TO THE NEXT PAGE.

Questions 34-36

You are the locational research consultant to a company that manufactures product X. One of three areas, A, B, or C, will be the location of a new plant to be built by the company. The data you have available on each of these areas as a prospective location for the manufacture of product X represent all costs and are as follows.

	Area A	Area B	Area C
Marketing Costs	$1,500,000	$1,700,000	$2,100,000
Material Assembly Costs	2,200,000	1,200,000	2,000,000
Labor Costs	2,500,000	2,500,000	1,800,000

34. The locational advantage of area A in the table would be

(A) marketing costs
(B) least total costs
(C) labor costs
(D) construction costs

35. The locational advantage of area B in the table would be

(A) advertising costs
(B) marketing costs
(C) labor costs
(D) least total costs

36. The locational advantage of area C in the table would be

(A) marketing costs
(B) material assembly costs
(C) labor costs
(D) tax costs

---

37. Foreign investment by United States manufacturers is greatest in countries

(A) with small total amounts of manufacturing
(B) that supply the United States with basic mineral products
(C) that have large total amounts of manufacturing
(D) that supply the United States with basic agricultural products

38. Which of the following is most responsible for the lack of foreign investment by United States manufacturers in Eastern Europe?

(A) The absence of East European manufacturing
(B) Poor political relations
(C) The lack of United States investment capital
(D) Poor returns on investments

39. Which of the following is most responsible for the small amount of investment by United States manufacturing companies in Africa?

(A) The lack of African labor
(B) Poor political relations
(C) The lack of United States investment capital
(D) Poor returns on investments

40. Assume that you are a United States manufacturer who now wishes to establish a factory in a foreign country. Which of the following kinds of data about the countries of the world would be most useful to you?

(A) The magnitude of coal deposits and reserves
(B) The amount of United States foreign investment
(C) The capacity of ports and harbors
(D) The size of agricultural surpluses

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.